

School of Science and Technology

**Laurea Triennale/Undergraduate Degree Course in Computer Science
– Information Technology track**

Classe L-31 – Scienze e Tecnologie Informatiche

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1. Introduction

This University's handbook contains the main information about the Degree course in Computer Science. In particular, this handbook shows the training targets of the Degree Course, the requirements necessary to attend the course as well as the list of training activities available for the academic years 2009-2010 with the related teachers. For further information students can visit our website at <http://www.cs.unicam.it>.

2. Training Targets

Training targets qualifying the class

The degrees of this class give theoretical, methodological, experimental and application skills in the fundamental areas of computer science representing the conceptual and technological base for the IT approach to the study of problems and for design, production and use of several applications requested by the Society of Information to organize, manage and gain access to information and knowledge. Therefore graduates from this class will be able to contribute to the activities of planning, design, development, work supervision, evaluation, test and management of plants and systems to make, transmit and work out information with the use of standardized methods. Graduates from the degree courses of the class need to:

- have knowledge and skills in several areas of sciences as well as information and communication technologies aimed at their use for design, development and management of IT systems;
- have ability to tackle and analyse problems as well as develop IT systems for their solution;
- get the investigation methods and be able to apply them to real situations with suitable knowledge of mathematical instruments supporting IT skills;
- be fluent in at least a language of the European Union, written and oral, in addition to Italian within the specific competence area and for the exchange of general information;
- be able to work in teams, operate with precise autonomy standards and promptly enter the labour market.

Employment and profession reference areas for the graduates of this class are design, organization, management and maintenance of IT systems (paying attention to the requirements of reliability, performance and security), both for manufacturers in the areas of network and IT systems and for companies, the civil service and, in general, all organizations using IT systems. Moreover they can gain access to the further studies of computer science area.

For these reasons, degree course curricula of the class:

- include, in any case, activities aimed at getting: instruments of discrete and continuum mathematics; knowledge of principles, structures as well as of the use of processing systems; techniques and methods of design as well as creation of both basic and application IT systems; knowledge of application areas; moreover it is suitable to include foundations of business and professional culture as well as foundations of society and law culture;
- have to include, in any case, lectures and laboratory exercises as well as suitable autonomous project activities and suitable individual laboratory activities within the training activities in several disciplinary areas;
- include external activities connected to specific aims, such as placements at companies, the civil service and laboratories in addition to study stays at other Italian and foreign universities also considering the international agreements.

Specific training targets of the course and description of the teaching curriculum

The undergraduate degree course in Computer Science, encompassing Class L-31 of Degree courses in Sciences and Information Technologies, aims to qualify a professional computer scientist with a technical and managerial preparation necessary for the rapid introduction to the labour market of activities, such as industry, finance, private and public sectors. Graduates in computer science have a basic cultural preparation, allowing them to successfully tackle the progression of technology and of the career towards responsibility roles as well as attending postgraduate courses.

Computer scientists get specific theoretical and operating skills in computer science, specific abilities to be applied to proper models and mathematical methods as well as suitable knowledge for the introduction to professional areas of new information technologies to understand the scientific evolution and rule the technological evolution.

Computer scientists work by using specific theoretical and operational IT skills, applications of proper models and mathematical methods with the necessary knowledge of economics and law, paying attention to the aspects involving the introduction of new technologies.

After a first stage, mainly dedicated to the achievement of a solid basic training in IT area and to the acquisition of fundamental knowledge in similar subjects, such as mathematics, the degree course includes a second more professionalizing stage oriented to the employment in IT market. In this second stage the student is involved in a placement in a factory, in training activities supporting the relative courses and in the choice of a subject for the final thesis. The students will have to take 18 examinations, be on a 300-hour placement in organizations/companies in national or international areas, where UNICAM has an agreement, and take a final examination, that is the discussion of a thesis on a specific subject to get the degree.

3. Learning outcomes

Graduates in computer science from the University of Camerino need to have the following qualifications expressed by higher education descriptors:

<p><i>Knowledge and understanding</i></p>	<p>Graduates in Computer Science have the scientific knowledge and understanding ability allowing to tackle and solve typical society's problems through innovative information technologies. In particular:</p> <ul style="list-style-type: none"> • they can critically understand the basic contexts in several areas of information and communication sciences and technologies, aimed at their use in designs, developments, and management of information systems, data bases and computer networks; • they have a good knowledge of central area of computer science: computer programming, computer architecture, algorithms, data bases, programming languages, operating systems, networks, software engineering; • they have knowledge of several areas similar to computer science, such as logic, statistics and economics; • they have a background in mathematics, physics and theoretical computer science. <p>The above mentioned skills can be obtained through the participation in front lectures as well as exercises and through the tutored (or independent) personal study within basic and characterizing disciplinary sectors: MAT/01-MAT-09, FIS/01-FIS02, INF/01, ING-INF/05.</p> <p>The achievement of learning outcomes is mainly verified by written and/or oral exams. Intermediate tests are included.</p>
<p><i>Applying knowledge and understanding</i></p>	<p>Graduates in computer science can apply their knowledge and their understanding ability in order to show a professional approach to work. They have the proper skills to tackle and solve IT problems. In particular:</p> <ul style="list-style-type: none"> • they can use specification and programming languages and programming methods for the problem solving within Information and Communication Technology (ICT); • they can engineer, develop and manage information systems, databases and computer networks; • they have logical-deductive reasoning to be applied to the solution of algorithmic and programming problems. <p>The achievement of the above mentioned abilities is carried out through</p>

	<p>the participation in front lectures and laboratories within the characterizing activities. The carrying out of individual and/or team projects is included for the characterizing topics.</p> <p>The achievement of these skills is verified by written and/or oral exams, reports, exercises and by critical analysis of the results obtained during the project carrying out.</p>
<p><i>Making judgements</i></p>	<p>Graduates in computer science have the ability to autonomously determine, assess and work out the critical aspects of knowledge and IT technologies as well as their social and ethical impact. In particular:</p> <ul style="list-style-type: none"> • they can assess and choose the right solution strategies to be applied to concrete situations with the suitable knowledge of mathematical instruments supporting information skills; • they have ability of judgement and assessment of medium term innovative information technologies. <p>Exercise and laboratory activities as well as personal papers, team projects and degree thesis offer students the chance to autonomously develop, their own decision and judgement abilities. They also offer the skill to find and examine information sources, data and scientific literature.</p> <p>The acquisition of judgement autonomy is verified by the assessment of courses, and in particular of those including a project activity.</p>
<p><i>Communication skills</i></p>	<p>Graduates in compute science can properly use written and oral English language in addition to Italian both within its specific competence and for general information communications. They can work in teams, to operate with precise autonomy standards and to promptly fit in workplaces.</p> <p>Communication skills are developed through characterizing training activities including the preparation of oral reports and written documents, the participation in project work teams, the oral exposition of these projects and the related tests. Moreover the acquisition of the above mentioned abilities includes the writing of final dissertation and its related discussion. A wide range of tests, oral exams, projects discussions, also through the help of multimedia instruments and computer presentations, is included for these abilities.</p>
<p><i>Learning skills</i></p>	<p>Graduates in computer science have the scientific and technological knowledge as well as learning skills so that they can go on with further studies. The natural following step for graduates in computer science is the postgraduate degree of class LM-18. In particular:</p> <ul style="list-style-type: none"> • they have inclination to study update on available information instruments; • they project their skills to attend additional training courses with precise autonomy standards to continue their own professional training. <p>Learning skills are carried out during the study paying attention to the individual study included, to the preparation of individual projects as well</p>

as to the activities necessary to prepare the final dissertation.

Learning skills are verified by tests during the training activities also assessing the ability to respect deadlines. Moreover, they are verified by autonomy assessment to find information and through the verification of self-learning ability obtained during the carrying out of activity related to the final dissertation.

4. Employment prospects

Graduates in Computer Science can be employed in the following areas:

- software analysis, coding and maintenance
- design and management of IT systems and databases
- management of computing processes and innovation of techniques in business management
- design and development of business networks and web services
- information management within one company and from one company to another

The involved professionals include IT technicians, software developers, web designers, software architecture engineers, computer network managers, software engineers. Some typical IT professionals are:

- IT junior engineer;
- software developer;
- software engineer;
- computer network manager;
- distributed application engineer;
- expert of e-commerce infrastructures;
- software architecture engineer;
- expert of security systems.

ISTAT classification of professions: 2.1.1.4 – Computer Scientists and Telecommunication expert: procedure analyst, program analyst, system analyst, EDP programming analyst, software engineer, expert in information sciences.

Italian junior engineering Register

Graduates in computer science are eligible to be on the Italian junior Engineering register, department B, area "Information Engineering" but they must pass an exam that is carried out by UNICAM. Reference law: DPR n.328 5th June 2001 - issued on GU (official gazette) n.190 dated 17th August 2001.

The exam is divided into two tests:

- a written test concerning the subjects of the area, they ask to be registered;
- a second written test on subjects within one of areas concerning the class of the specific degree
- an oral test on subjects concerning the written tests and on legislation and ethics;
- a practical on design within one of areas concerning the class of the specific degree.

The exam for junior engineer provides two sessions: 1st session on 30th June 2009 and 2nd session on 1st December 2009.

5. Qualifications to access undergraduate degree course

Applicants must have a diploma from secondary school or any other school certificate obtained abroad and recognized as suitable. The knowledge of written and oral Italian as well as

mathematical knowledge and logic-analytical abilities supplied by most secondary school curricula. Entry requirements will be verified by a national entrance test for scientific degree courses. Recovery courses are included for the applicants who did not get a good mark.

6. Teaching organization

The teaching organization of the undergraduate degree course in computer science can be accessed on-line by the service "didattica d'ateneo" available at <https://didattica.unicam.it>

European Credit Transfer and Accumulation System (ECTS)

Students are assessed by credits to indicate their learning standard. The credits represent their learning work including individual studies and practise (also laboratory) necessary to get the undergraduate degree course in computer science.

60 credits represent the medium study workload carried out by a full-time student with suitable starting preparation for one academic year.

Students have to get 180 credits and one credit is equal to a 25-hour standard workload for each student.

For example, one credit might be equal to 7 hours of lectures in classroom or 10 hours in laboratory.

The ratio of time spent for tutored activities and time spent for individual studies within the programme of training activities should usually be about 1:3.

These figures may vary according to the kind of course. Moreover a credit should represent a 25-hour workload for a student who is getting ready for the final exam and possible placement or apprenticeship.

6 or 12-ECTS courses are provided for the degree course in computer science.

All activities concerning ECTS must be assessed. The assessment is expressed by specific committees chaired by the staff in charge of training activities. Courses can be either individual or integrated with a corresponding laboratory module. There will be one single exam in case of complementary courses. Course examinations are usually carried out written and oral. In case of integrated courses specific tests and final projects can be provided in addition to the written and oral test. If not differently indicated, training activities are assessed by a grade expressed in 30ths "cum laude" with honours. Verification of attendance and a report on activities carried out and signed by the teacher are necessary to give credits for placements or apprenticeships. The assessment can be expressed with only 2 grades: "idoneo" (suitable) or "non idoneo" (not suitable).

The classification of teaching hours for each ECTS is as follows: 1 ECTS usually represents a 7-hour frontal course including 4 hours dedicated to the introduction of "new contents" (classic frontal course) and 3 hours dedicated to their in-depth study. Some exceptions are laboratory modules that is 1 ECTS represents a 9-hour practice tutored by a teacher or a joint project coordinated by a teacher. Therefore courses allowing to get 6 ECTS represent a 42-hour frontal course or 54-hour laboratory course/module. ECTS of training activities borrowed from other degree courses will be calculated according to university's degree course handbook.

Welcome to new undergraduate students

All students enrolling on the degree course in computer science will take an entrance test with the purpose to orient students through foundation courses necessary to bridge possible gaps. Date and test will be the same as proposed at national level. Acclimatization courses followed by foundation courses for new undergraduate students will start on 1st October. A complementary English course is included for those who do not have the minimum basic knowledge.

Lecture and exam calendar

Teaching activities (including foundation courses for new undergraduate students) will start on 5th October 2009. They are divided into 2 semesters according to the following calendar:

I Semester Teaching Activity	1 st October 2009 (1 st Year) 5 th October 2009 (2 nd and 3 rd Year)	To	29 th January 2010
I Exam session	1 st February 2010	To	26 th February 2010
II Semester Teaching activity	1 st March 2010	To	11 th June 2010
II Exam Session	14 th June 2010	To	30 th July 2010
III Exam Session	31 st August 2010	To	1 st October 2010

Information about lecture calendar and rooms where lessons are taken are available at <http://www.unicam.it/studenti>.

Exam sessions are provided for every course at the end of each period.

The teachers will have to inform students about the kind of examination for each course quite in advance; the exam will only be oral if not specified.

The exams can include the carrying out of projects and seminars, suitable for promoting the grade of autonomy and independence in the student. The student who wants to take an exam is obliged to register on-line (<https://didattica.unicam.it>) for the session of the specific course.

The exam programme is the last teaching programme carried out for the same course. Therefore the programme carried out during the course will generally be valid for 12 months from the end of teaching activities.

The calendar of exam sessions and teaching programmes are available at: <https://didattica.unicam.it>.

Tutoring, vocational guidance and placement

The Consiglio del Corso di Studio (Council of Study Programme) promotes periodical meetings with the students through the tutoring coordinator to discuss about the general course state of training activities. The Consiglio del Corso di Studio gives each student a tutor, the students can turn to for insertion problems, vocational guidance, planning of their own study programme. The Consiglio del Corso di Studio organizes activities of vocational guidance for the students in the last year of degree course who want to go on studying or start working.

Students can talk to every teacher at least two hours a week where they can get explanations about lecture topics. Students can ask for explanations by sending the teacher an e-mail. The placement included at the end of the 3rd year can be carried out at organizations/companies, where UNICAM has an agreement, or at research and inner development laboratories in our university.

Students from the degree course in computer science can apply for a placement only after getting 120 ECTS. The *regulations* of applications and grants are available on-line at: <http://www.cs.unicam.it>. Students can ask the placement coordinator for further information. Moreover supplementary courses are run by graduates, final year students or senior students and they are aimed at new students for practice, explanations, also going through the main programme subjects.

International Mobility

Students can join programmes providing scholarships to attend courses abroad. The Consiglio del Corso di Studio, through its coordinator, promotes meetings with the students to encourage the international mobility both to universities within Erasmus programme and to universities where an international cooperation agreement is available. The Consiglio del Corso di Studio will credit the activities expressed in the learning agreement. The student who carries out a training activity abroad for at least 6 months will receive an acknowledgement at final assessment. The degree course in computer science involving the Erasmus programme has reached an agreement with the following European universities:

Country	University	Language	Learning activities
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ES - Spain	Universidad de Burgos	SPANISH	<i>Courses/Thesis for Undergraduate</i>
FI - Finland	Helsinki Metropolia University of Applied Sciences	ENGLISH	<i>Courses/Thesis for Undergraduate</i>
IS - Iceland	Reykjavik University	ICELANDIC (Undergraduate Study) ENGLISH (Postgraduate Study)	<i>Courses/Thesis for Undergraduate and Postgraduate/PhD</i>
PL – Poland	Politechnika Gdanska	ENGLISH	<i>Courses/Thesis for Undergraduate</i>
NL – Netherlands	Technische Universiteit Eindhoven	ENGLISH	<i>Courses/Thesis for Undergraduate /PhD</i>
PL - Poland	Technical University of Lodz	ENGLISH	<i>Courses/Thesis for Undergraduate</i>
GR – Greece	Technological Institute of Larissa	GREEK	<i>Courses/Thesis for Undergraduate</i>
ES - Spain	Universidad de Vigo	SPANISH	<i>Courses/Thesis for Undergraduate and Postgraduate/PhD</i>
SE – Sweden	Mälardalen University	ENGLISH	<i>Courses/ Thesis for Undergraduate and Postgraduate/PhD</i>
CH- Switzerland	University of Applied Sciences Northwestern Switzerland	ENGLISH	<i>Courses/ Thesis for Postgraduate</i>

Moreover, the student can access the Erasmus Placement programme providing scholarships to be on a placement at European companies for the development of the thesis and international cooperation programmes available with the master/postgraduate degree course of the University of Camerino with European, non-European universities and companies. Students will get full acknowledgement of the activities carried out abroad within their own curriculum. For further information, students can turn to the international mobility coordinator.

Credit recognition

Possible ECTS recognition for activities carried out before the enrolment on degree course or the beginning of degree course training activities is included to promote the enrolment for brilliant and motivated young people. 6 ECTS for free activities are the maximum we can credit. Students can get ECTS as follows: 1) not over 3 ECTS for study projects properly agreed between the secondary school and the university (if the two bodies have an agreement) 2) not over 3 ECTS for the participation in provincial Mathematics competition with recommendation for national competition.

As about point 1, ECTS will be given according to the introduction of a report (paper, hypertexts, posters, etc.) on an agreed topic and its positive assessment by a committee made up of degree course teachers.

Special knowledge, in particular English if over PET, can grant further credits depending by the Teaching Council subject to verification of the knowledge.

Scholarships

Several scholarships and incentives are available to promote the enrolment on degree course in computer science for brilliant and motivated students. Moreover the University of Camerino calls for scholarships addressing to students enrolled on the degree course yearly. Further information will be available at <http://www.unicam.it>

Final thesis and getting the degree

The final dissertation represents the discussion of a written paper which can be a technical report concerning the activity carried out at placements or a thesis concerning a topic chosen by the student within the characterizing courses. The paper is prepared under supervisor's guidance and it is assessed with numbers 18-30.

The degree grade, expressed with numbers 66-110 with "cum laude", assesses students' curriculum, their preparation and their scientific maturity obtained at the end of the degree course. The degree grade is calculated with an average considering the number of credits, assessments of all courses including the final dissertation. If the grade obtained is at least 111 "cum laude" is proposed. The thesis rules with procedure how degree grades are given are available at (<http://www.cs.unicam.it>). For further information, students can get in touch with the Degree coordinator.

7. Teaching Curriculum

The following tables shows how credits are distributed within the courses characterizing the curriculum of the degree course in Computer Science

1st YEAR

N	Course	Total ECTS credits	Modules	ECTS for Scientific Disciplinary Sector	Kind of activity (*)	Grade or suitability
1	Computer programming + Lab	12	Programming	6 INF/01	a	Grade
			Programming Laboratory	6 INF/01		
2	Mathematics	12	Mathematical Analysis	6 MAT/05	a	Grade
			Discrete Mathematics	6 MAT/02	a	Grade
3	Foundations of Computer Science	6		6 INF/01	a	Grade
4	Computer Architecture + Lab	12	Computer Architecture	6 ING-INF/05	a	Grade
			Computer Architecture	6 ING-INF/05		
5	Logic I	6		6 MAT/01	a	Grade
6	Physics	6		6 FIS/01	a	Grade
7	English	6		6 L/LIN12	e	Grade

(*) The kind can be a) basic training activities b) characterizing training activities c) similar or additional activities d) training activities chosen by the student e) for the final examination or for foreign language skills f) others (further language skills, IT and relational skills, placements, etc.) g) training activities within the specific building.

2nd YEAR

N	Course	Total ECTS credits	Module	ECTS for Scientific Disciplinary Sector	Kind of activity	Grade or suitability
8	Algorithms and Data Structures + Lab	12	Algorithms and Data Structures	6 INF/01	b	Grade
			Algorithm and Data Structure Laboratory	6 INF/01		
9	Mathematical Programming	12	Operations Research	6 MAT/09	c	Grade
			Numerical Analysis	6 MAT/08	c	Grade
10	Probability and Statistics	6		6 MAT/06	c	Grade
11	Operating Systems + Lab	12	Operating Systems	6 INF/01	b	Grade
			Operating System Laboratory	6 INF/01		
12	Databases + Lab	12	Databases	6 INF/01	b	Grade
			Database Laboratory	6 INF/01		
13	Project Management	6		6 SECS-P/08	c	Grade

3rd YEAR

N	Course	Total ECTS credit	Module	ECTS for Scientific Disciplinary Sector	Kind of activity	Grade or suitability
14	Software Engineering + Lab	12	Software Engineering	6 INF/01	b	Grade
			Software Engineering Laboratory	6 INF/01		
15	Computer Networks + Lab	12	Computer Networks	6 ING-INF/05	b	Grade
			Computer Network Laboratory	6 ING-INF/05		
16	Project Work	6		6 INF/01	b	Grade
1	Free choice option (**)	12			d	Grade

7						
	Placement	12			f	Suitability
	Final exam	6			e	Grade

(**) All courses at the University of Camerino or at other Italian or foreign universities are provided within training activities of free choice option, in particular: Web Technologies, C++ Programming, Network Policies and Security, .NET Programming, Discrete Events Systems Simulation, Combinatorial Optimization, Computational Graphics, Systems of Automation, Law and Digital Economy, e-Commerce, Information Technology Law, Political Economy, Economics, Community Law of Information and New Technologies, Enterprise Strategies, Enterprise Statistics.

Progression constraints

The teaching curriculum requires that the progression constraints are achieved:

- at least 6 ECTS within Discrete Mathematics, Mathematical Analysis and Physics are necessary to take second year exams;
- Computer Programming + Programming Lab exam must have been taken to take Algorithm and Data Structures + Lab exam
- Computer Architecture + Computer Architecture Lab must have been taken to take Operating Systems + Operating System Lab.

Courses available for academic year 2009-2010

Students of the degree course in Computer Science can include in their study plan free choice courses within all courses available for the academic year 2009-2010 from the School of Science and Technology and from the Department of Mathematics and Informatics.

8. Entry requirements

The topics of the syllabuses synthetically listed below are well-known for the basic teaching organization by new undergraduate students. Therefore the knowledge of these topics is essential to undertake the degree course in Computer Science in a profitable way.

Mathematics Syllabus

Numerical structures. The natural numbers: arithmetic operations and properties. The division with remainder. Prime numbers and factorization. Greater common divisor and least common multiple. Numerical fractions: operations and ordering. Relative integers. Relative rational numbers. Representation of numbers as decimal alignment. Intuitive idea of real numbers. Inequalities and related calculus rules. Absolute value. Arithmetic mean and geometric mean. Powers and roots and their properties. Logarithms and their properties.

Elementary algebra, equations, inequalities. Elements of expression and polynomial, use of brackets. Polynomials. Remarkable products. Division with remainder between polynomials. Ruffini's rule. Rational fractional expressions. Identities and equations: solution knowledge. First degree equations and quadratic equations. Linear systems of two equations in two unknowns. Inequalities. First degree and quadratic inequalities. Inequalities with two fractional expressions. Radicals, inequalities with radicals.

Sets, relations and functions, elements of logic. Set elementary language: belonging, inclusion, union, complementary, empty set. Ordered couples (Cartesian product). Relations, functions (or applications). Connective: negation, conjunction, disjunction, theorem, lemma, corollary, hypothesis, theory.

Geometry. Euclidean plane geometry: existence and uniqueness of the parallel and of the perpendicular for a point at assigned line. Linear measure, segment length (distance between

two points), biunique correspondence between the points of a line and real numbers, circumference length. Angle width, degree and radian measures, sum of inner angles of a triangle, angles made up of two parallels cut by a transversal; congruence and similitude. Equidecomposability of polynomials and elementary knowledge of area. Circle area. Remarkable geometric places: segment axis, angle bisector, circumference. Properties of plane figures: criteria of triangle congruence and similitude. Parallelograms, Thales' Euclid's and Pythagoras' theorems. Segment and angle properties of circle (ropes, secants, tangents, angles at the centre and at circumference). Cartesian coordinates: line and circumference equations, equations of simple geometric places (parabolas, ellipses, hyperbolas) in suitable reference systems. Trigonometry: sine, cosine, angle tangents; fundamental trigonometric identity $\sin^2 x + \cos^2 x = 1$, addition formulas. Euclidean space geometry: intuitive idea of volume of solids, calculation of volume and area of parallelepiped surface, pyramids, prisms, cylinders, cones, and spheres.

Successions and elementary functions. Succession knowledge. Arithmetic and geometric progressions. Numerical functions and their graphs. Function domain. Properties of some elementary functions and their graphs: first degree and quadratic polynomials, logarithm and exponential functions, trigonometric functions. The logarithm function as inverse of exponential. Recurrence of trigonometric functions.

Computer Science syllabus

Fundamental concepts. Computer and its functional units: central processing unit, memory unit, input and output unit. Coding and memorization of information, bit and byte. Operating system, verbatim and graphical interfaces, online and from menu commands, buttons and icons. System and application software, intuitive knowledge of algorithms and programs.

Basic operating capacity. Start and shutdown of a work session, program launching, creation, copy and cancellation of a document, opening, updating and printing of a document. Use of electronic mail and document sending. Access and browse on the Internet.